A Description of a New Species of Enoploteuthid Cephalopod, *Abralia siedleckyi* spec. nov., with Some Remarks on *Abralia redfieldi* G. Voss, 1955

(Cephalopoda : Enoploteuthidae)

BY

MAREK LIPIŃSKI

Sea Fisheries Institute, 81-345 Gdynia, Poland

(8 Text figures)

INTRODUCTION

The Open Ocean Expedition of R/V *Professor Siedlecki* to the South Atlantic waters in 1978 collected more than 2500 specimens of cephalopods. Some of them appeared to be new species; among them were three specimens of *Abralia*.

Besides this, the only other species of *Abralia* collected by R/V *Professor Siedlecki* in 1978 was *Abralia redfieldi* G. Voss, 1955, which was not previously recorded in the South Atlantic Ocean. Three hundred sixteen specimens of this species, also mature males, were collected at the seven stations.

Additional material concerning this species was collected by R/V *Professor Bogucki* east of Recife (Brazil) in 1977 (five specimens).

The localities of new *Abralia* species and new distribution of *A. redfieldi* are illustrated in Figure 1.

METHODS

Measurements were taken of squids which had been kept for two years in 70% ethyl alcohol.

A 1mm ruler and 0.1mm caliper were used for routine measurements. Microscopic observations and measurements were made by means of an MB-30 PZO microscope, MST 131 PZO stereomicroscope and Carl Zeiss micrometric microscope.

The surfaces of the eyeball photophores were calculated by use of equations $S = \pi ab$ (ellipse) and $S = 0.785D^2$ (circle).

The following abbreviations were used:

DML —dorsal mantle length, defined as in G. Voss (1963: 11-12);
VML —ventral mantle length (G. Voss, *loc. cit.*);
HL —head length, measured from nuchal cartilage to V-shaped juncture between arms I;
HW —greatest width of head across eyes;
FL —greatest length of fins, parallel to body's axis;
FN —length of fins from anterior border of juncture between fins to the apex of the mantle;
FWL —greatest width across both fins;
MW1-MW3—widths of mantle, defined as in Roper *et al.*(1969: 297);
A1-A4 —lengths of arms I-IV p., respectively, measured from first basal sucker to tip of arm. Left arms are usually measured;
TL,TR—lengths of left and right tentacular arms, measured from base to the tip of dactylus;
CL —club length, measured from first carpal knob or sucker to the tip of dactylus;
GL —gladius length;
H1-H4—number of hooks on arms I-IV, respectively. Hooks on the left arms are usually counted, except in mature males, where both ventral arms are examined.

The measurements and indices for spermatophores were used after N. Voss (1969: 735).

Tail is defined here as distal end of a body cone without fins or their rudiments.

MATERIAL AND DESCRIPTIONS

Abralia siedleckyi spec. nov.; Figures 2-7, Table 1.

Holotype: male, fully mature (V;[1]), DML = 31mm; R/V *Professor Siedlecki*, Sta. 98/43: 39°05′08″S; 13°43′E (start), 39°00′S; 13°44′E (end); sea depth 1910m, catch depth 500m; dawn, 3 July 1978; midwater trawl 110 feet [33m] with 6mm codend mesh.
Coll. number: SFI IXEN 212.
Collector: M. Lipiński.

Paratypes: male, fully mature (V), DML = 30mm, R/V *Professor Siedlecki* Sta. 98/43; female, fully mature (V), DML = 33mm, same.
Coll. numbers: SFI IXEN 213-214.
Collector: M. Lipiński.

[1] According to maturity scale proposed by Lipiński (1979).

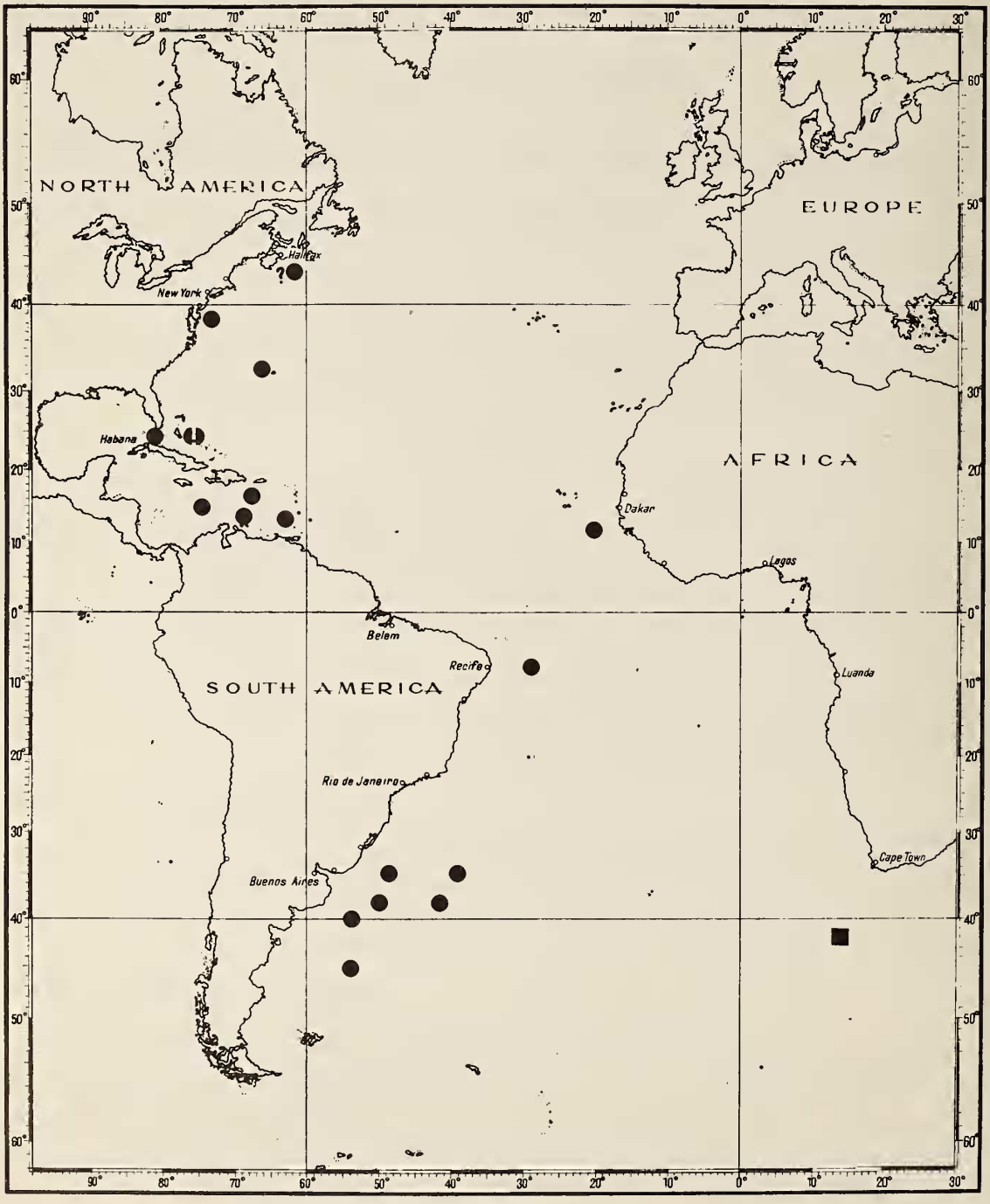


Figure 1

Distribution of the *Abralia* species described in the paper: *Abralia redfieldi* G. Voss, 1955 (●; ◖—location of the type), and *A. siedleckyi* Lipiński, spec. nov. (■). Most northerly findings of *A. redfieldi* are according to AMARATUNGA *et al.* (1980: 17)

Description: The mantle is fairly short (present range of DML within the genus: 21-62mm) and conical, widest at the anterior margin (MWlI = 42%). The antero-dorsal margin is projected forward and forms a distinct obtuse angle. The antero-ventral margin is excavated beneath the funnel with marginal acute angles. The posterior end of the mantle is bluntly pointed, but there is no tail. The gladius shows through the mantle dorsally as a dark line.

The fins are large (FLI = 64-67%; FWLI = 103-106%), their antero-lateral margins are convex, the postero-lateral margins concave and pointed laterally. The anterior lobes project antero-laterally, beyond the mantle.

The head is fairly narrow and long (HWI = 27%, HLI = 39%). Proximally, there are three nuchal folds.

The buccal membrane connectives typical.

The eyes are large but not prominent, the anterior sinus is inconspicuous. The light organs on the eyeball are invisible through the muscles and skin (there are no ventral windows). On the dorsal side of the head there are two characteristic windows, completely devoid of chromatophores, otherwise completely covering the head. Under the skin and thin wings of the cartilaginous skull there are large, oval optic glands.

The funnel is large; it projects about one-third beyond the ventral mantle margin; the funnel groove has an inconspicuous lateral fold. The mantle-funnel locking apparatus is simple, consisting of a straight groove on the mantle. The funnel organ consists of a prominent dorsal pad with long apical papilla and broad shoulders with conspicuous lateral ridges, which continues to 1/5-1/6 of the fleshy arms. Ventral pads large, oval.

The arms are of moderate length, arm formula 4.2.3.1. Arms I-III are keeled; longest keel on III; IV lacks keel. The arms are stout and strong, gradually becoming slender. On their proximal two-thirds, the arms bear two rows of hooks: I-12-14; II-12-14; III-12-14; IV-11 (hectocotylized) and 11-16 (normal). Distally the hooks are followed by many biserial rows of small oval to round suckers that gradually become minute. The suckers and hooks are bordered on either side, on arms I-III, by a protective membrane between conspicuous trabeculae. This membrane is very low and inconspicuous dorsally and well-developed ventrally, especially on arms II-III. Arms IV have very low rudimentary protective membranes from which the ventral is better developed, and bear a well-developed swimming membrane on its dorso-lateral surface.

The tentacles are long and slender, slightly flattened laterally, length more than 100% of DML. Clubs small, very slightly expanded, with three hooks on the right club (armature of the left club incomplete). The basal hook is the smallest, the middle - the largest. The two distal hooks are long, thin, flattened laterally. Dorsally to the hooks are two regular rows of suckers; first (marginal) row contains only three relatively large suckers, next row - five similar suckers. Suckers on the dactylus small, tetraserial. Carpus bears four small suckers and three flat, inconspicuous knobs. Protective membrane on the dorsal side broad and fleshy, broadest at the attachment of the largest hook. Protective membrane on the ventral side thin, paper-like, broadest at the attachment of the proximal hook, then gradually becomes very low and inconspicuous.

In the male, the left ventral arm is hectocotylized. Proximally there are 10 normal hooks; eleventh small hook lies dorsally at the beginning of the large, ventral flap. This flap is semicircular and does not continue to the tip of the arm. It lies at the beginning of the distal half of the arm and occupies about 20% of the arm length. The dorsal flap lies distally to the ventral one. It is small (about 9% of the arm length), semicircular, diagonally set on the oral surface of the arm. It does not continue to the end of the arm. The remaining part of the hectocotylized arm (about 29% of the arm length) is devoid of suckers to the tip; it bears well-developed protective membranes (the ventral one is better developed).

As in the other members of the genus, there are very distinct photophore patterns; photophores are mainly placed on the ventral parts of the arms IV, head, eyeballs, funnel and mantle.

The photophore pattern on the ventral part of the eyeballs is most distinct and constant in all cases. There are five photophores: posterior extra large, oval, creamy white, with inconspicuous ventral and dorsal sinuses; small, round, orange; small-medium, round, red; small, round, orange; anterior small-medium (little, or not larger than medial), round, or slightly oval, creamy white, with no sinuses. The large, posterior photophore is 11-13 times larger than the anterior.

The eyelid bears the following pattern of photophores: on the ventral side (below the sinus) 16 larger and 15 small black photophores alternately, then above the sinus three oblique black photophores; dorsally 12-16 black, small photophores.

The photophores on the bases of arms I-III are few; same on the base of swimming keel on arms III. Bases of arms IV with 9-10 ventrally set, slightly irregular, oblique rows of all three kinds of photophores; marginal rows more regularly set than medial ones. Only second dorsal row continues to the arm tip; ventral row ends subterminally, and first dorsal row ends much earlier.

The dorsal side of the head has only a few very small, irregularly set photophores. The ventral surface of the head covered with ten white photophores, arranged in the regular pattern; an additional such photopore lies at the base of each arm IV, near conjunction between them. The

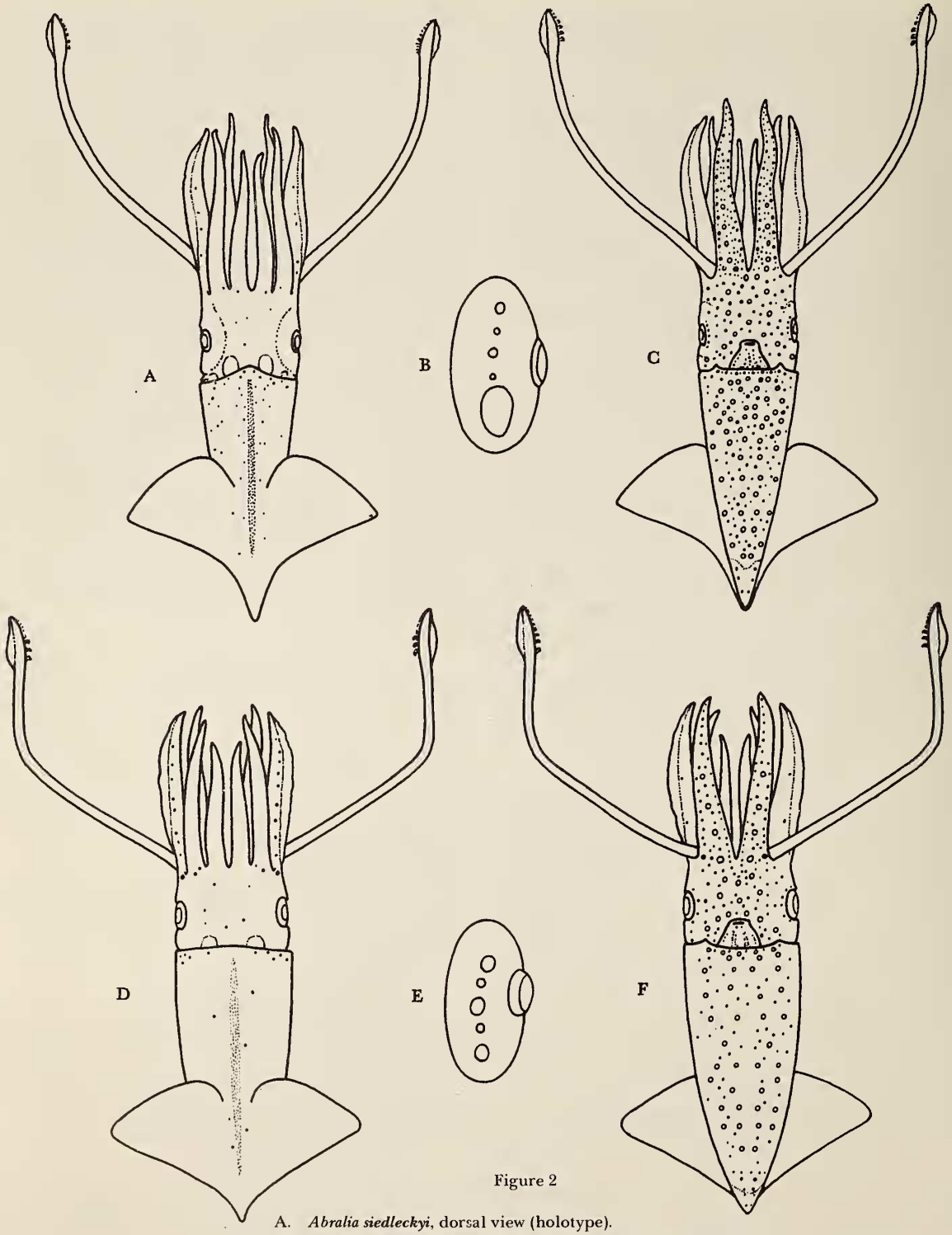


Figure 2

A. *Abralia siedleckyi*, dorsal view (holotype).
B. Same, left eyeball; C. Same, ventral view;
D. *A. redfieldi*, dorsal view (R/V *Prof. Siedlecki*, Sta. 10/5, DML = 30mm, female); E. Same, left eyeball; F. Same, ventral view

photophores of two other types are fairly irregularly dispersed. There are about 40 larger photophores and twice as many smaller ones.

Funnel has four regular multiple bands of photophores; there are 30-36 black photophores in each medial band, and only 4-6 in the marginal ones. There is one white photophore anteriorly in each marginal band and ⅓ the way down each medial one. Lateral bands biserial.

Mantle is dorsally covered with very small photophores, widely set in about 8-14 longitudinal rows; photophores in the first row are most regularly arranged.

The skin on the dorsal surface of the fins is damaged, but there still remain a few small black photophores.

Ventrally, the mantle is covered with numerous photophores of all three usual types. The first proximal row and white photophores are set in orderly arrangement,

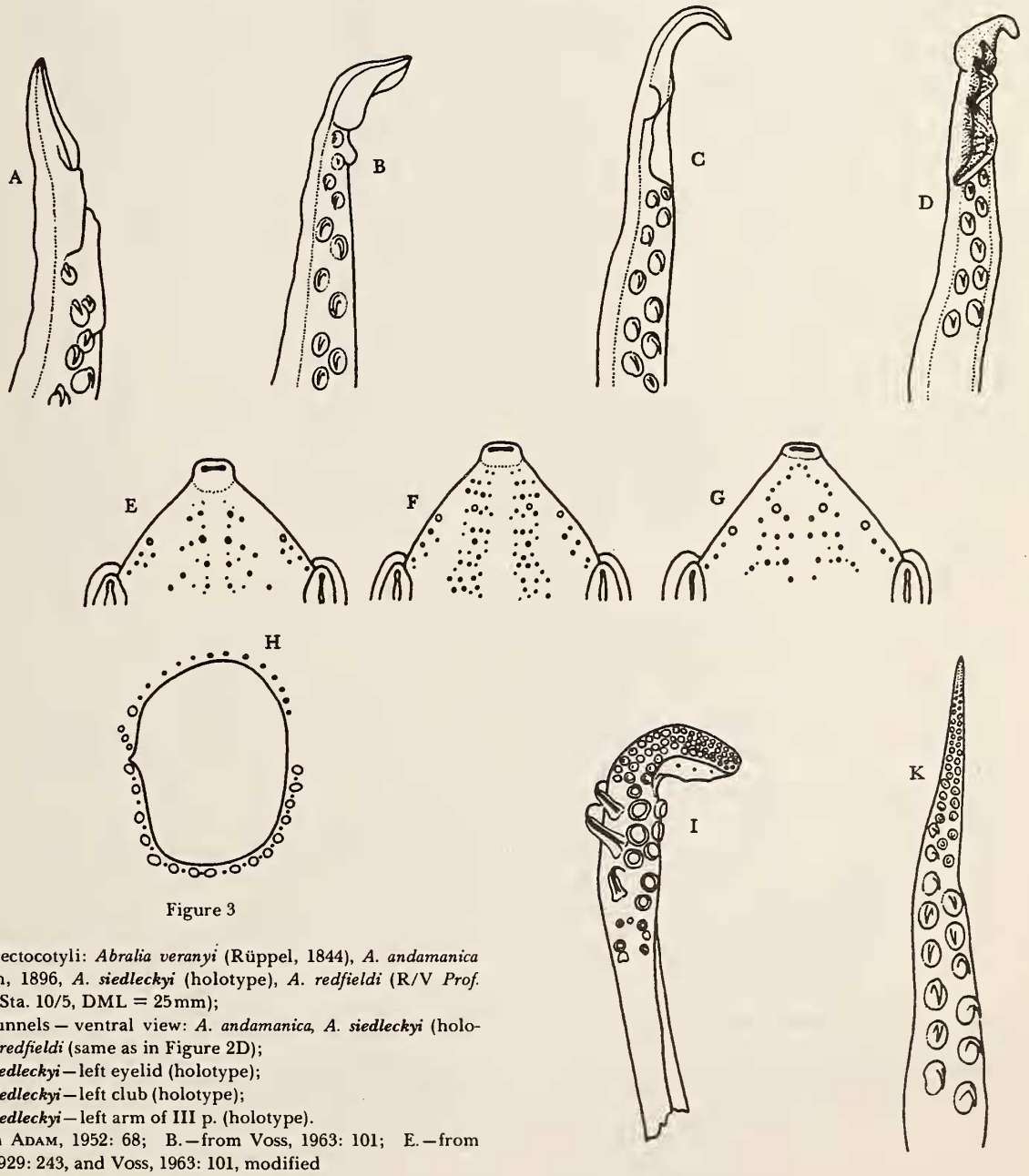


Figure 3

A-D. Hectocotyli: *Abralia veranyi* (Rüppel, 1844), *A. andamanica* Goodrich, 1896, *A. siedleckyi* (holotype), *A. redfieldi* (R/V *Prof. Siedlecki*, Sta. 10/5, DML = 25mm);
E-G. Funnels — ventral view: *A. andamanica*, *A. siedleckyi* (holotype), *A. redfieldi* (same as in Figure 2D);
H. *A. siedleckyi*—left eyelid (holotype);
I. *A. siedleckyi*—left club (holotype);
K. *A. siedleckyi*—left arm of III p. (holotype).
A.—from Adam, 1952: 68; B.—from Voss, 1963: 101; E.—from Sasaki, 1929: 243, and Voss, 1963: 101, modified

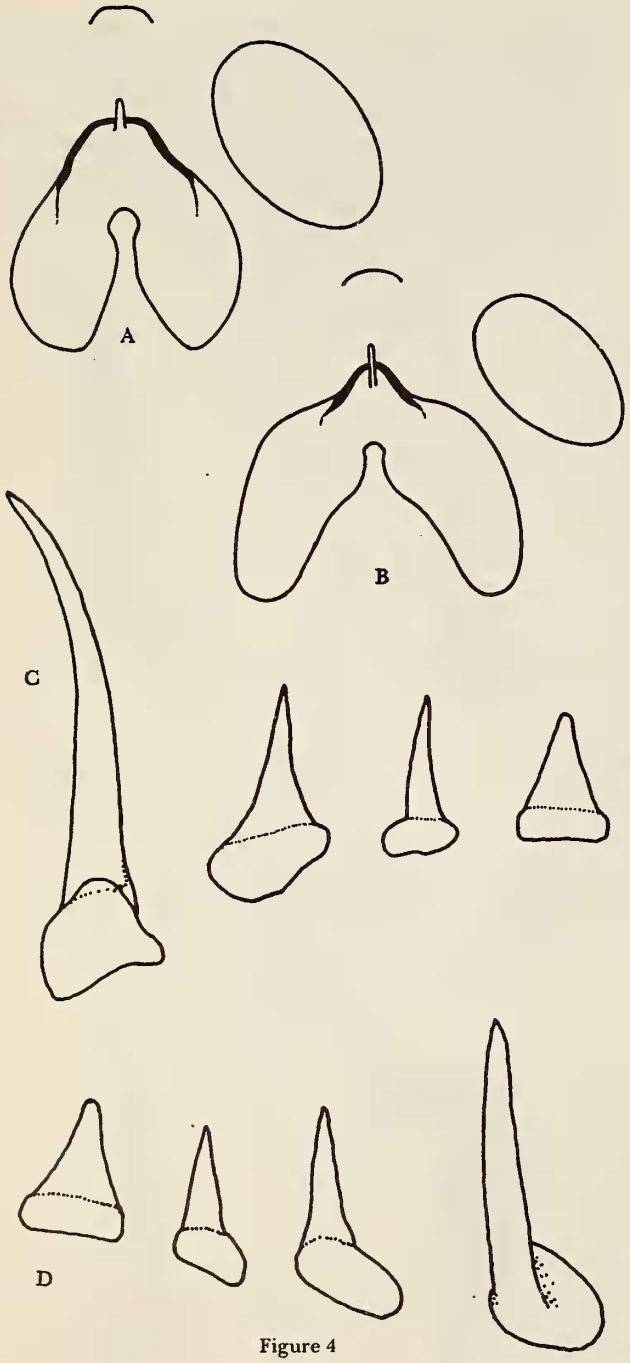


Figure 4

A-B. Funnel organs: *A. siedleckyi* (holotype), *A. redfieldi* (same as in Figure 2D);
C. *A. siedleckyi*—radula (paratype, DML = 31 mm, male);
D. *A. redfieldi*—radula (R/V *Prof. Siedlecki*, Sta. 10/5, DML = 29 mm, female)

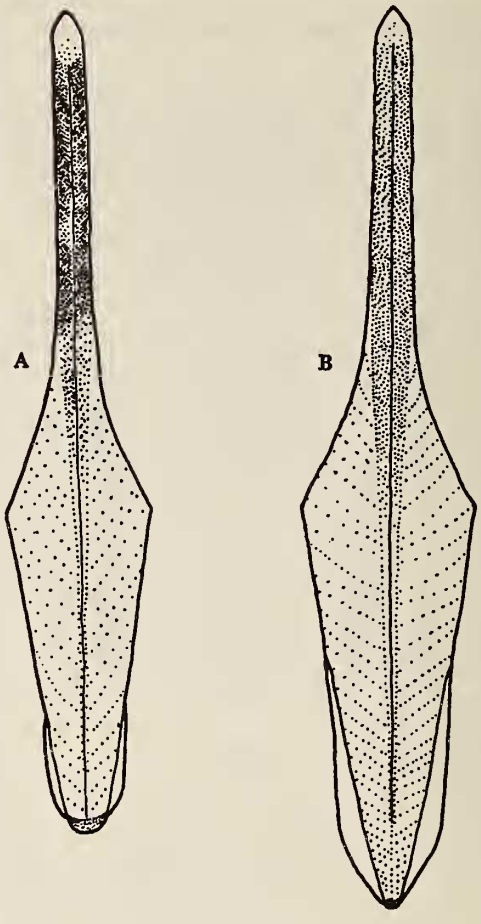


Figure 5

A. *Abralia redfieldi*—gladius; B. *A. siedleckyi*—gladius

others are irregular. The first row consists of bigger black photophores inter-spaced with smaller ones; the white photophores are regularly set in 14-15 transverse rows. There is no ventral midstripe devoid of light organs.

Ventral surface of the distal tip of the mantle is semi-gelatinous, devoid of chromatophores, with only two lateral bands of widely spaced black photophores.

Spermatophores small, numerous. SpMI = 16.2%; CBI = 46.2%; SpWI = 1.2%; EjAI = 37.6% (Figure 7).

Gladius (Figure 5) occupy about 84% of DML and do not enter the gelatinous cone.

Table 1

The measurements of the *Abralia siedleckyi* Lipiński, spec. nov. and *Abralia redfieldi* G. Voss, 1955 specimens.

Feature	Species																			
	Abralia siedleckyi			*Abralia redfieldi* (R/V *Professor Siedlecki*, 1978)																
	Holo-type	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
DML	31	30	33	24	25	30	27	23	23	28	26	27	24	25	26	24	26	24	22	25	24
VML	28	28	31	22	24	29	26	22	21	27	25	26	22	24	25	22	24	22	20	23	22
HL	12	12	12	11	11	13	11	10	10	11	10	12	11	14	11	8	11	9	9	10	10
HW	8	8	7	8	9	11	8	9	7	10	8	7	7	8	8	7	8	7	7	6	8
FL	20	20	21	13	13	17	14	13	12	14	14	15	12	12	14	11	12	11	11	11	12
FN	16	16	17	10	10	14	12	9	10	13	12	12	11	11	11	9	10	10	9	9	9
FWL	32	31	35	22	22	26	24	23	21	24	22	21	21	25	22	22	25	23	21	23	20
MW_1	13	13	13	10	10	13	10	10	10	11	10	10	9	10	10	9	11	10	10	10	10
MW_2	10	11	11	9	9	11	9	10	8	10	10	10	9	9	8	8	10	9	8	9	9
MW_3	8	8	9	8	8	10	8	9	7	9	8	8	8	8	8	6	8	8	6	7	9
A_1	15	16	13	8	8	12	10	10	9	10	9	10	10	11	9	8	10	9	9	9	10
A_2	20	19	16	10	11	11	11	11	9	11	9	12	12	13	15	9	11	12	10	11	12
A_3	17	16	14	8	8	11	10	8	6	10	9	11	10	14	16	11	12	12	12	12	12
A_4	19	20	18	9	12	12	11	11	9	11	10	11	12	13	16	11	13	14	14	12	13
TL	–	52	–	25	30	37·	27	23	30	30	29	35	31	30	30	27	29	28	29	28	27
TR	48	–	–	28	27	–	31	25	29	30	29	35	30	29	–	24	26	25	25	24	25
CL	4	–	–	2	4	5	2	3	4	3	4	3	2	4	4	3	5	3	4	4	3
GL	–	26	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
H_1	14	14	12	13	11	13	12	13	13	16	13	13	11	12	11	15	12	12	13	14	16
H_2	13	14	14	16	13	12	12	14	15	14	15	12	12	13	12	11	13	14	13	13	15
H_3	13	12	14	13	12	12	12	11	16	13	12	12	11	11	14	16	11	12	11	12	12
H_4[3/]	11/16	11/14	12	14	11	16	15	10	11	15	15	14	10	10	13	9/13[1]	0/14	9/12	11/12	9/14	10/13

[1]In the case of mature males, both arms were investigated (upper—hectocotylized).

Vane broad, long (⅔ of GL); conus small, rather sharp. The walls of vane are set at angle of 90° or slightly less.

Radula (Figure 4c) contains seven rows of unicuspid teeth.

Beaks (Figure 6c-d) strong, enoploteuthid-like. Lower beak has conspicuous ridge on the lateral wall.

Color in the 70% ethyl alcohol: dark grayish-brown.

Etymology: The specific name was given in honor of the late Professor Michal Siedlecki, Polish marine biologist.

Holotype and paratypes are located at Museum, Sea Fisheries Institute, 81-345 Gdynia, Al. Zjednoczenia 1, Poland.

Abralia redfieldi G. Voss, 1955; Figures 2-8, Table 1.

Material examined: A. eight males, maturity II-V, DML range 23-27 mm; 20 females, maturity II-III, DML range 23-30 mm; R/V *Professor Siedlecki*, Sta. 10/5, 45°06′1″S; 54°02′02″W (start), 45°10′3″S; 54°04′4″W (end); depth of catch 45-55 m; 9 May 1978; midwater trawl 110 feet [33 m], codend with 6 mm mesh liner; total number of specimens in the sample: 242.

Data from other stations, where *Abralia redfieldi* was caught were as follows:

- Sta. 3/3: 35°04′1″S; 39°22′8″W (start), 35°04′2″S; 39°18′9″W (end); depth of catch 300 m; day, 4 May 1978; gear as Sta. 10/5; 20 specimens;
- Sta. 11/6: 45°33′S; 54°01′W (start), 45°38′8″S; 54°01′1″W (end); depth of catch 320 m; night, 10 May 1978; gear as Sta. 10/5; 4 specimens;
- Sta. 39/14: 40°01′2″S; 53°45′5″W (start), 39°59′S; 53°42′W (end); depth of catch 720 m; dawn, 22 May 1978; gear as Sta. 10/5; 1 specimen;
- Sta. 44/17: 37°55′3″S; 49°51′1″W (start), 37°55′2″S; 49°48′1″W (end); depth of catch 640 m; night, 23 May 1978; gear as Sta. 10/5; 4 specimens;
- Sta. 49/18: 38°02′S; 42°03′W (start), 38°01′9″S; 41°58′2″W (end); depth of catch 230 m; night, 25 May 1978; gear as Sta. 10/5; 21 specimens;
- Sta. 57/21-59/23. Central position: 34°58′S; 48°34′W; depth 24-210 m; night, 29-30 May 1978; gear as Sta. 10/5; 24 specimens.

Coll. numbers: SFI IXE 210-211(M).

Collector: M. Lipiński.

B. four males (some with spermatophores), and one immature female (III); DML range 25-27 mm (males), and 30 mm (female); R/V *Professor Bogucki*, Sta. 2: 7°26′S; 28°28′W (central position); depth of catch 70 m; day, 2 December 1977; midwater trawl 110 feet, codend with 6 mm liner.

Coll. numbers: SFI IXE 205-209.

Collector: W. Ślósarczyk.

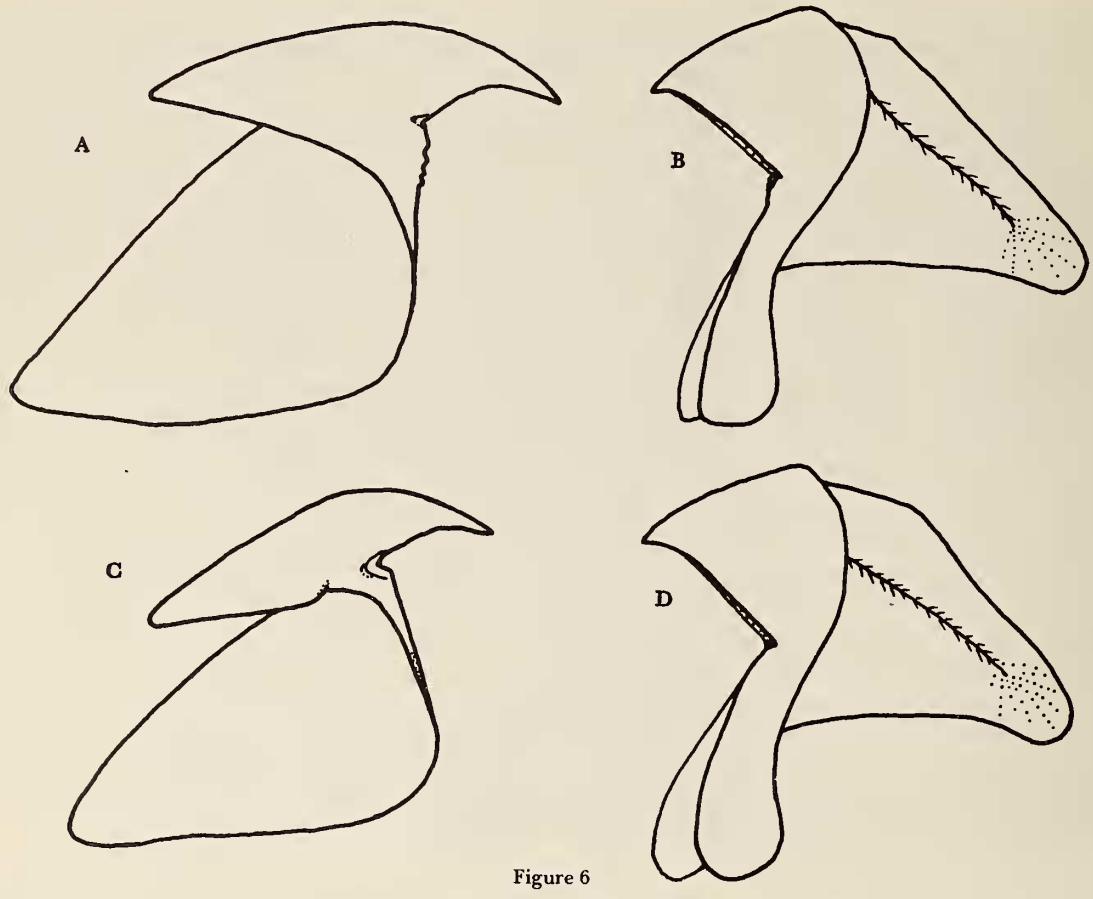


Figure 6

A-B. *Abralia redfieldi*—upper and lower beak (same as in Figure 4D);
C-D. *A. siedleckyi*, upper and lower beak (same as in Figure 4C)

Description: The mantle is fairly short and conical, widest at the anterior margin (MW1I = 37-48%). The antero-dorsal margin is fairly straight, with no distinct angle. The antero-ventral margin is excavated beneath the funnel with acute marginal angles. The posterior end of the mantle is bluntly pointed, with a very small tail (5-6% of DML). The gladius shows through the mantle dorsally as a dark line, but is not protruding.

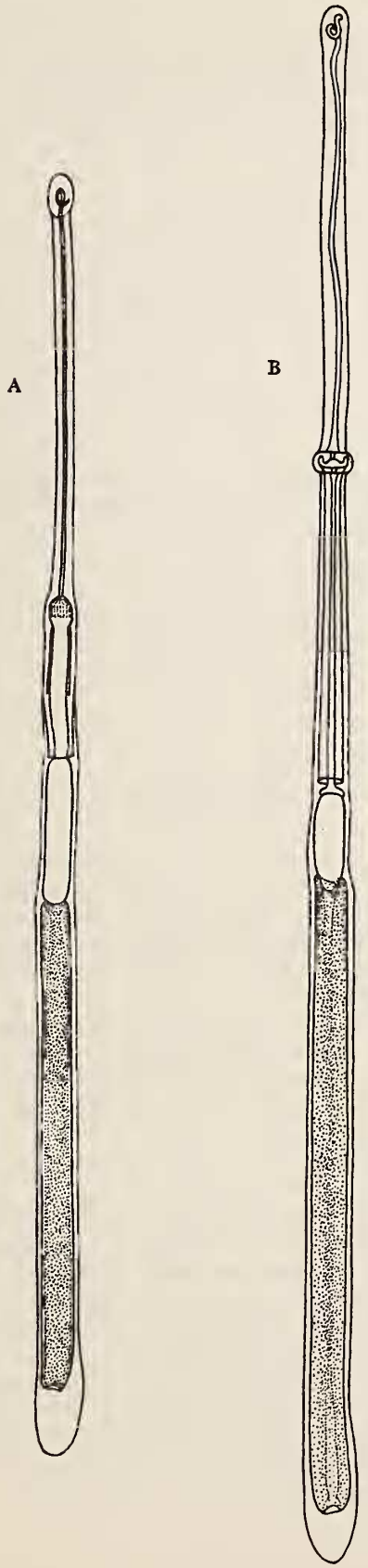
The fins are fairly short (FLI = 46-57%) but broad (FWLI = 83-100%), their antero-lateral margins are convex, the postero-lateral margins concave and rounded laterally. The anterior lobes ("ears") project forward, within the contour of the mantle.

The head is compact, squarish (HWI = 27-39%, HLI = 36-46%). Proximally, there are three nuchal folds. The buccal membrane connectives typical.

The eyes are large, but not prominent; anterior sinus is inconspicuous. The eyeball light organs are clearly visible through muscles and skin; small ventral windows present. Dorsally there are clear windows, with only tiny chromatophores; under these windows are large optic glands.

The funnel is large, projecting about one-fourth beyond the ventral mantle margin; the funnel groove has conspicuous, small lateral fold. The funnel-mantle locking apparatus is typical. The funnel organ consists of a prominent dorsal pad with filamentous papilla. Shoulders short; arms long, bean-shaped. Short, inconspicuous lateral ridge projects from papilla to beginning of arms. Ventral pads large, oval.

The arms are of moderate length; arms II-IV almost equal, arms I usually shorter. Arms I-III are keeled; IV



lacks keel. All arms are stout and strong, gradually becoming slender, and bear on their proximal two-thirds the following number of hooks, arranged biserially: I—11-16; II—12-16; III—11-16; IV—9-10 (hectocotylized) and 10-16 (normal). Distally, hooks are followed by 7-10 pairs of small oval to round suckers which gradually become minute. The suckers and hooks bordered on either side of arms I-III by a protective membrane between conspicuous trabeculae. This membrane is fairly low dorsally and well-developed ventrally. Arms IV have very low rudimentary protective membranes (ventral one is better developed), and bear well-developed swimming membrane on their dorso-lateral surface.

The tentacles are long and slender, slightly flattened laterally, length more than 100% of DML. Clubs small, slightly expanded, with three ventral hooks almost equal in size (the middle hook is slightly larger than the marginal ones). Dorsally to the hooks there are two rows of suckers: first lateral row contains four relatively large suckers, next —four smaller suckers. At the base of the first (proximal) hook there is one medium sucker. Suckers on the dactylus tetraserial, proximally medium, then gradually become small. Carpus bears four small suckers and 6-7 flat knobs. Protective membrane on the dorsal side of the manus broad and fleshy; on the ventral side thin, paper-like.

In the male the right ventral arm is hectocotylized(2). Proximally there are 9-10 normal hooks; eleventh small hook sometimes present in the younger animals at the base of the first flap. The distal half of the arm is occupied by three flaps: two proximal ones large, spoon-shaped, located medially on the oral side with oblique, thick, muscular base (immature males have these flaps directly on the ventral side); distal flap located dorsally, small, semicircular, does not extend to the arm tip. Proximally to the last flap lies semioval, ventral fold of swimming membrane. The tip of the hectocotylized arm is devoid of suckers (immature males have several pairs of small suckers on this part of arm). Approximate proportions of the main parts of hectocotylized arm are as follows: hooks 50% of arm length; flaps 33%, suckerless tip 17%.

The photophore pattern on eyeballs, arms IV, head, funnel and mantle is very distinctive.

On the **eyeballs** are five fairly widely spaced light organs in the following order: medium, small, medium, small, medium. All these organs are round, red-green or red-yellowish. Medium photophores are 2.5-3.0 times greater than small ones. The pattern described is the same in all cases investigated.

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[2] Description of hectocotylus is based only on the mature males with spermatophores in the Needham's sac.

← Figure 7

A. Spermatophore of *Abralia siedleckyi* (holotype);
B. Spermatophore of *A. redfieldi* (R/V *Prof. Siedlecki* Sta. 10/5, DML = 25mm)

In the ventral half the eyelid bears 15-16 larger photophores irregularly spaced with smaller ones; dorsal part has smaller widely-spaced photophores, plus one bigger and one smaller just below the sinus.

The photophores on the bases of arms I-III are few; usually there are no photophores on I, two small black photophores on II, one large white and several small black photophores on III. A few photophores on the base of the swimming keel on III (usually eight on the dorsal and two at the base of the ventral side). These photophores are fairly regularly spaced. Bases of arms IV have five regular rows of photophores of all three kinds (Sasaki, 1929: 245). First dorsal row is long; second is very short; third extends to the arm's tip; next is very short; ventral one is long. The white photophores on the arms IV are very large.

Dorsally, head has 0-3 irregularly spaced very small photophores, deeply embedded in the tissue. The ventral surface of the head covered with twelve white photophores, arranged in regular pattern; additional ones are at the base of each arm IV. The other two kinds of photophores are arranged in 10-12 irregular longitudinal rows.

Funnel has four regular multiple bands of photophores; there are 19-22 black photophores of two kinds in each medial band and a single row of three larger black photophores in each marginal one. There is one white photophore anteriorly in each lateral band and in the proximal ⅓ of each medial band.

Mantle and fins dorsally covered with a few very small photophores, especially near the gladius and anterior border of the mantle; last ones are regularly spaced in two rows. Ventrally, the mantle is covered by numerous photophores of all three usual types. The anterior row contains photophores fairly irregularly arranged. There are six longitudinal, broad, irregular multiple bands of photophores of all three types; sometimes these bands are indistinct, but there always remains the medial midstripe devoid of photophores. The large white photophores are set in 12-15 transverse rows (in the middle of VML somewhat irregularly set).

Ventral surface of the distal tip of the mantle is semigelatinous, devoid of chromatophores, with only two lateral strips of widely-spaced black photophores.

Spermatophores small; SpMI = 40.2%, CBI = 28.5%, SpWI = 3.6%, EjAI = 31.3%; the structure of spermatophores is very different from that of *Abralia siedleckyi* (Figure 7).

Gladius (Figure 5a) occupy about 89% of DML and do not enter the gelatinous cone. Vane broad, long (⅔ of GL); conus small, rounded. The walls of vane are set at angle of 90° or slightly less.

Radula (Figure 4d) contains seven rows of unicuspid teeth.

Beaks (Figure 6a-b) strong, enoploteuthid-like. Lower beak has conspicuous ridge on the lateral wall.

The whole body is covered with thin, whitish, gelatinous envelope, not mentioned by G. Voss (1955: 99-102).

The length frequency of *Abralia redfieldi* from the R/V *Professor Siedlecki* (Sta. 10/5) is presented in Figure 8.

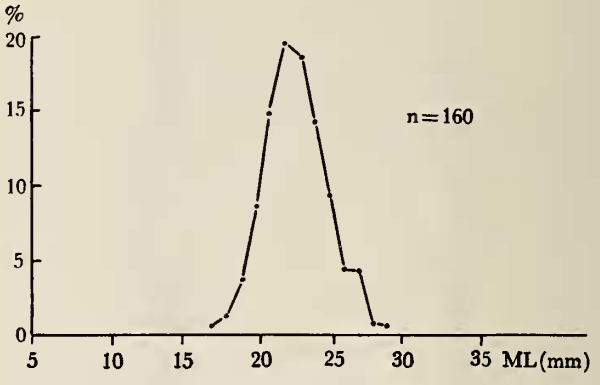

Figure 8

Length frequency distribution of *Abralia redfieldi* from South Atlantic waters (R/V *Prof. Siedlecki*, Sta. 10/5, 9 May 1978)

DISCUSSION

Abralia siedleckyi spec. nov. and *A. andamanica* Goodrich, 1896 are undoubtedly closely related, and as substantial variation of the latter species was reported, a problem exists in respect to the systematic status of *A. siedleckyi*.

Abralia andamanica could probably be split into the following subspecies:

- *A. andamanica andamanica* Goodrich, 1896 (Andaman Sea, Philippines; Goodrich, 1896; G. Voss, 1963: 99-105);
- *A. andamanica robsoni* Grimpe, 1931 (Japan; Sasaki, 1929: 242-245; Grimpe, 1931; 150 and 164; G. Voss, *loc. cit.;* Okutani, 1974: 38);
- *A. andamanica* subspec. A (Hawaiian Islands; Okutani, 1974: 33);
- *A. andamanica* subspec. B (Galapagos Islands and 30° north to Marquesas Islands; Okutani, 1974: 34-38).

The differences between these subspecies concern the following features: body proportions, tentacular armatures, photophore arrangement on the mantle, head, arms and eyeballs, and shape of hectocotylus.

Abralia siedleckyi has similar body proportions as *A. andamanica* subspec. B (the individual illustrated by Okutani, *op. cit.:* (Figure 2), but differs from all other described or illustrated forms of *A. andamanica* by the following characteristics:

- size and shape of photophores on the eyeballs (Figure 2b);
- shape of hectocotylus (Figure 3b-c);
- proportions of manus/dactylus (Figure 3i).

In all known subspecies of *A. andamanica* the anterior and posterior photophores of the eyeballs are larger than the other three and are of different shape; *i.e.*, external photophores are elongate oval. *A. siedleckyi* has an anterior photophore of similar shape and only slightly larger than the medial one. I consider this characteristic alone to be a species-level difference. This view is supported by other differences between *A. andamanica* subspecies and *S. siedleckyi:*

- all forms of *A. andamanica* have dactylus much longer than manus;

  A. siedleckyi has dactylus only slightly longer;
- all forms of *A. andamanica* have hectocotylus with ventral flap slightly longer, equal or much shorter than dorsal;

Abralia siedleckyi has ventral flap three times longer. Other differences between these species concern the probable distribution of photophores on the funnel and eyelid, shape of the funnel organ, and spermatophores; unfortunately, these characteristics have not been described or illustrated for all *A. andamanica* subspecies.

Okutani (1974) described morphological changes with growth concerning *Abralia andamanica?* subspec. B; the present material was insufficient to point out the differences between *A. andamanica* subspecies and *A. siedleckyi* in growth sequences, therefore only adults of these species were compared.

Abralia redfieldi is now known from 43° N to 45° S (Amaratunga *et al.*, 1980: 17; G. Voss, 1955: 99; Nesis, 1975: 260-261; Cairns, 1976: 244; Lu & Roper, 1979: 5; and present material). This species was found only once in the eastern Atlantic, near Dakar (Lu & Clarke, 1975: 372). Such distribution may indicate that *A. redfieldi* is a relatively "young" species, developed in Caribbean center of evolution.

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Literature Cited

Adam, William
1952. Résultats scientifiques des expéditions océanographiques belges dans les eaux côtières africaines de l'Atlantique Sud. (1948-1949). Cèphalopodes. Rèsult. scient. Expéd. océanogr. Belg. (1948-49), 3(3): 1-142
1973. *Cephalopoda* from the Red Sea. Bull. Sea Fish. Res. Stan., Haifa, 60: 9-47
Amaratunga, Tissa, T. Rowell & M. Roberge
1980. Summary of joint Canada/USSR Research Program on short-finned squid *(Illex illecebrosus),* 16 Feb. to 4 June 1979; spawning stock and larval survey. NAFO Scr. Doc. 80/11/38: 1-36 (MS)
Cairns, S. D.
1976. Biological results of the University of Miami deep-sea expeditions. 118. Cephalopods collected in the Straits of Florida by the R/V "Gerda." Bull. mar. Sci. 26(2): 233-272
Clarke, Malcolm R.
1966. A review of the systematics and ecology of oceanic squids. Adv. mar. Biol. 4: 91-300
Goodrich, Edwin S.
1896. Report on a collection of *Cephalopoda* from the Calcutta Museum. Trans. Linnean Soc., London 7: 1-24; 5 plts.
Grimpe, Georg
1931. Teuthologische Mitteilungen. XIII. Über die Cephalopoden der Sunda-Expedition Rensch. Zool. Anz. 95: 149-174
Lipiński, Marek
1979. Universal maturity scale for the commercially important squids *(Cephalopoda : Teuthoidea).* The results of maturity classification of the *Illex illecebrosus* (Lesueur, 1821) populations for the years 1973-1977. ICNAF Res. Doc. 79/II/38: 1-40 (MS)
Lu, Chung-Cheng & Malcolm R. Clarke
1975. Vertical distribution of cephalopods at 11° N; 20° W in the North Atlantic. Journ. mar. biol. Assoc. U.K. 5: 369-389
Lu, Chung-Cheng & Clyde F. E. Roper
1979. Cephalopods from deepwater dumpsite 106 (Western Atlantic): vertical distribution and seasonal abundance. Smithsonian Contrib. Zool. 288: i-iii + 1-36
Nesis, Kir N.
1975. Cephalopods of the American Mediterranean Sea. Trudy Inst. Okean. AN SSR 100: 259-288 (in Russian)
Okutani, Takashi
1974. Epipelagic decapod cephalopods collected by micronekton tows during the EASTROPAC expeditions, 1967-1968 (systematic part). Bull. Tokai Reg. Fish. Res. Lab. 80: 29-118
Pfeffer, Georg
1912. Die Cephalopoden der Plankton Expedition. *In:* Ergebnisse der Plankton-Expedition der Humboldt-Stiftung, 2: i-xxi + 1-815; atlas of 48 plts.
Roper, Clyde F. E., Chung-Cheng Lu & Katharina Mangold
1969. A new species of *Illex* from the western Atlantic and distributional aspects of other *Illex* species *(Cephalopoda : Oegopsida).* Proc. Biol. Soc. Wash. 82: 295-322
Sasaki, Madoka
1929. A monograph of the dibranchiate cephalopods of the Japanese and adjacent waters. Journ. College Agric. Hokkaido Univ. 20(Suppl.): 1-357; 158 figs.; 30 plts.
Voss, Gilbert L.
1955. The cephalopods obtained by the Harvard-Havana Expedition off the coast of Cuba in 1938-1939. Bull. Mar. Sci. Gulf and Carib. 5(2): 81-115
1963. Cephalopods of the Philippine Islands. Bull. U.S. Nat. Mus. 234: 1-180; 36 figs.
Voss, Nancy A.
1969. A monograph of the *Cephalopoda* of the North Atlantic. The family *Histioteuthidae.* Bull. Mar. Sci. 19(4): 713-867; 37 figs.